CLAIMS

1. A component mounting order optimization method executed before carrying out a component mounting operation in which a component is held from one component supply part (103a) disposed at a component holding position (171) among a plurality of component supply parts arranged in parallel and arranged movably for supplying components, is transferred to a component mounting position (172), and is mounted to a mounting point (173) on a circuit board (2) disposed at the component mounting position by moving in X-axis and Y-axis directions,

the method comprising:

optimizing an arrangement of the component supply parts with position information of the mounting points taken into account; and then

optimizing a component mounting path to the circuit board under the optimized arrangement of the component supply parts.

2. The component mounting order optimization method according to Claim 1, wherein the optimization of the arrangement of the component supply parts is carried out by temporarily arranging the component supply parts and correcting the temporary arrangement before optimizing the component

mounting path.

3. The component mounting order optimization method according to Claim 2, wherein the temporary arrangement in optimizing the arrangement of the component supply parts is executed by obtaining a product of variances for each of X and Y-coordinate values and Z-values showing locations of the component supply parts in terms of the mounting points of the circuit board while the Z-value is changed, and then obtaining the arrangement of the component supply parts which makes the variance product smaller.

4. The component mounting order optimization method according to Claim 3, wherein, the arrangement which makes the variance product smaller is obtained by executing:

a first process of obtaining a first variance product for a first arrangement of the component supply parts;

a second process of obtaining a second variance product for a second arrangement different from the first arrangement; and

a third process of comparing the first variance product and the second variance product with each other and setting the smaller one as a new first variance product,

thereby obtaining a much smaller new first variance product by repeating the second process and the third process

subsequently.

5. The component mounting order optimization method according to Claim 2, wherein, for correcting the temporary arrangement in optimizing the arrangement of the component supply parts, after the component supply parts are temporarily arranged by obtaining the smaller variance product, the location of a second component supply part (103a-2) is changed on a basis of a distance between a reference mounting position (178) on the circuit board where the component supplied from a first component supply part (103a-1) adjacent to the component holding position is to be mounted and an object mounting position (179) on the circuit board where the component supplied from the second component supply part other than the first component supply part is to be mounted, thereby further optimizing the arrangement of the component supply parts.

6. The component mounting order optimization method according to Claim 5, wherein the changing of the location of the second component supply part comprises:

obtaining each of the distances while the second component supply part is sequentially changed; and

arranging the second component supply part which makes the distance shortest adjacent to the first component supply part.

7. The component mounting order optimization method according to Claim 1, wherein the component mounting path

is optimized by selecting two mounting paths for connecting two mounting points among mounting paths, recombining the two mounting paths, and selecting the path having a shorter mounting path length through comparison between before and after the recombination, thereby executing the optimization.

8. The component mounting order optimization method according to Claim 7, wherein in order to reflect the mounting path optimized by the recombination of mounting paths to the mounting order, after the optimization, a mounting order for the mounting points which constitute the optimized mounting path is changed.

9. The component mounting order optimization method according to Claim 8, wherein the component supply parts are rearranged after the optimized mounting path is reflected to the mounting order, whereby the component mounting path is optimized and reflected to the mounting order.

10. A component mounting order optimization program for making a computer execute a component mounting order optimization method in a component mounting operation in which a component is held from one component supply part (103a) disposed at a component holding position (171) among a plurality of component supply parts arranged in parallel and movable for supplying components, is transferred to a component mounting

position (172), and is mounted to a mounting point (173) on a circuit board (2) disposed at the component mounting position by moving in X-axis and Y-axis directions,

the program comprising:

a procedure of optimizing an arrangement of the component supply parts with position information of the mounting points taken into account; and

a procedure of optimizing a component mounting path to the circuit board under the optimized arrangement of the component supply parts.

11. The component mounting order optimization program according to Claim 10, wherein the optimizing procedure for the arrangement of the component supply parts includes a procedure of temporarily arranging the component supply parts and a procedure of correcting the temporary arrangement before the optimizing procedure for the component mounting path.

12. The component mounting order optimization program according to Claim 11, wherein the temporary arrangement procedure in the optimizing procedure for the arrangement of the component supply parts includes a procedure of obtaining a product of variances of each of X and Y-coordinate values and Z-values showing locations of the component supply parts while the Z-value is changed in terms of the mounting points of

the circuit board, and a procedure of obtaining the arrangement of the component supply parts which makes the variance product smaller.

13. The component mounting order optimization program according to Claim 12, wherein the arrangement procedure of making the variance product smaller includes:

a first procedure of obtaining a first variance product for a first arrangement of the component supply parts;

a second procedure of obtaining a second variance product for a second arrangement different from the first arrangement;

a third procedure of comparing the first variance product and the second variance product with each other and setting the smaller one as a new first variance product; and

a procedure of obtaining a much smaller new first variance product by repeating the second procedure and the third procedure subsequently.

14. The component mounting order optimization program according to Claim 11, wherein the correcting procedure for the temporary arrangement in optimizing the arrangement of the component supply parts includes, after the component supply parts are temporarily arranged by obtaining the smaller variance product, a procedure of changing the location of a second component

supply part (103a-2) on a basis of a distance between a reference mounting position (178) on the circuit board where the component supplied from a first component supply part (103a-1) adjacent to the component holding position is to be mounted and an object mounting position (179) on the circuit board where the component supplied from the second component supply part other than the first component supply part is to be mounted, thereby further optimizing the arrangement of the component supply parts.

15. The component mounting order optimization program according to Claim 14, wherein the procedure of changing the location of the second component supply part includes a procedure of obtaining each of the distances while the second component supply part is sequentially changed and arranging the second component supply part which makes the distance shortest to be adjacent to the first component supply part.

16. The component mounting order optimization program according to Claim 10, wherein the optimizing procedure for the component mounting path includes a procedure of selecting two among mounting paths for connecting two mounting points, recombining the two mounting paths, and selecting the path having a shorter mounting path length through comparison between before and after the recombination, thereby executing the optimization.

17. The component mounting order optimization

program according to Claim 16, wherein in order to reflect the mounting path optimized by the procedure of carrying out the recombination of mounting paths to the mounting order, after the optimization, the program further includes a procedure of changing a mounting order at mounting points which constitute the optimized mounting path.

18. The component mounting order optimization program according to Claim 17, wherein after reflecting the optimized mounting path to the mounting order, the program further includes a procedure of rearranging the component supply parts, thereby optimizing the component mounting path and reflecting the component mounting path to the mounting order.

19. A computer readable recording medium with a program stored for making a computer execute a component mounting order optimization method in a component mounting operation in which a component is held from one component supply part (103a) disposed at a component holding position (171) among a plurality of component supply parts arranged in parallel and movable for supplying components, is transferred to a component mounting position (172), and is mounted to a mounting point (173) on a circuit board (2) disposed at the component mounting position by moving in X-axis and Y-axis directions,

the recording medium having the program for executing:

a procedure of optimizing an arrangement of the component supply parts with position information of mounting points taken into account; and

a procedure of optimizing a component mounting path to the circuit board under the optimized arrangement of the component supply parts.

20. The recording medium according to Claim 19, wherein the optimizing procedure for the arrangement of the component supply parts includes a procedure of temporarily arranging the component supply parts and a procedure of correcting the temporary arrangement before the optimizing procedure for the component mounting path.

21. The recording medium according to Claim 20, wherein the temporary arrangement procedure in the optimizing procedure for the arrangement of the component supply parts includes a procedure of obtaining a product of variances of each of X and Y-coordinate values and Z-values showing locations of the component supply parts while the Z value is changed in terms of the mounting points of the circuit board, and a procedure of obtaining the arrangement of the component supply parts which makes the variance product smaller.

22. The recording medium according to Claim 21, wherein the arrangement procedure for making the variance product

smaller includes:

a first procedure of obtaining a first variance product for a first arrangement of the component supply parts;

a second procedure of obtaining a second variance product for a second arrangement different from the first arrangement;

a third procedure of comparing the first variance product and the second variance product with each other and setting the smaller one as a new first variance product; and

a procedure of obtaining a much smaller new first variance product by repeating the second procedure and the third procedure subsequently.

23. The recording medium according to Claim 20, wherein the correcting procedure for the temporary arrangement in optimizing the arrangement of the component supply parts includes, after the component supply parts are temporarily arranged by obtaining the smaller variance product, a procedure of changing the location of a second component supply part (103a-2) on a basis of a distance between a reference mounting position (178) on the circuit board where the component supplied from a first component supply part (103a-1) adjacent to the component holding position is to be mounted and an object mounting position (179) on the circuit board where the component supplied from the

second component supply part other than the first component supply part is to be mounted, thereby further optimizing the arrangement of the component supply parts.

24. The recording medium according to Claim 23, wherein the procedure of changing the location of the second component supply part includes a procedure of obtaining each of the distances while the second component supply part is sequentially changed, and arranging the second component supply part which makes the distance shortest to be adjacent to the first component supply part.

25. The recording medium according to Claim 19, wherein the optimizing procedure for the component mounting path includes a procedure of selecting two among mounting paths for connecting two mounting points, recombining the two mounting paths, and selecting the path having a shorter mounting path length through comparison between before and after the recombination, thereby executing the optimization.

26. The recording medium according to Claim 25, wherein in order to reflect the mounting path optimized by the procedure of carrying out the recombination of mounting paths, after the optimization, the recording medium further includes a procedure of changing a mounting order at mounting points which constitute the optimized mounting path.

27. The recording medium according to Claim 26, wherein after the procedure of reflecting the optimized mounting path to the mounting order is carried out, the recording medium further includes a procedure of rearranging the component supply parts, thereby optimizing the component mounting path and reflecting the component mounting path to the mounting order.

28. A component mounting apparatus comprising:

a component supply unit (103) having a plurality of supply parts (103a) arranged in parallel for supplying components, for supplying components from one of the supply parts positioned to a component holding position (171);

a component shift device (105) having a component holder (105b), for transferring the component holder between the component holding position and a component mounting position (172), holding components (175) supplied from the supply parts by the component holders and mounting the components to mounting points (173) on a circuit board (2) at the component mounting position;

an orthogonal table (109) for holding the circuit board and moving the circuit board in X and Y-axes directions, thereby locating the mounting points to the component mounting position; and

a controller (180) for optimizing a mounting operation of the components to the circuit board from the supply parts, which

includes an arrangement optimizing part (181) for optimizing an arrangement of the supply parts with position information of the mounting points taken into account, and a mounting path optimizing part (182) for optimizing a component mounting path to the circuit board under the optimized arrangement of the supply parts.

29. The component mounting apparatus according to Claim 28, wherein the arrangement optimizing part obtains a product of three variances of each of X and Y-coordinate values and Z-values showing locations of the supply parts while the Z-value is changed in terms of the mounting points on the circuit board, and obtains the arrangement of the component supply parts which makes the variance product smaller.

30. The component mounting apparatus according to Claim 29, wherein the arrangement optimizing part obtains the arrangement which makes the variance product smaller by obtaining a first variance product for a first arrangement of the supply parts, obtaining a second variance product for a second arrangement different from the first arrangement, comparing the first variance product and the second variance product with each other to set the smaller one as a new first variance product, and obtaining a much smaller variance product as a new first variance product by repeating the comparison.

31. The component mounting apparatus according to

Claim 29, wherein the arrangement optimizing part further optimizes the arrangement of the supply parts, after optimizing the arrangement of the supply parts by obtaining the smaller variance product, caused by changing a location of a second supply part (103a-2) on a basis of a distance between a reference mounting position (178) where the component supplied from a first supply part (103a-1) adjacent to the component holding position is to be mounted and an object mounting position (179) where the component supplied from the second supply part other than the first supply part is to be mounted.

32. The component mounting apparatus according to Claim 31, wherein for changing the location of the second supply part, the distance is obtained while the second supply part is sequentially changed and the second supply part which makes the distance shortest is arranged adjacent to the first supply part.

33. The component mounting apparatus according to Claim 28, wherein the mounting path optimizing part optimizes by selecting two among mounting paths for connecting two mounting points, recombining the two mounting paths, and selecting the path having a shorter mounting path length through comparison between before and after the recombination.

34. The component mounting apparatus according to Claim 33, wherein the mounting path optimizing part changes a

mounting order of mounting points which constitute a new mounting path after the recombination of mounting paths, in accordance with the new mounting path.

35. The component mounting apparatus according to Claim 34, wherein the controller optimizes the component mounting path again by rearranging the supply parts after the component mounting path is optimized.

36. The component mounting apparatus according to Claim 28, wherein the component shift device rotates the component holder along a circumference between the component holding position and the component mounting position which are disposed on the circumference.